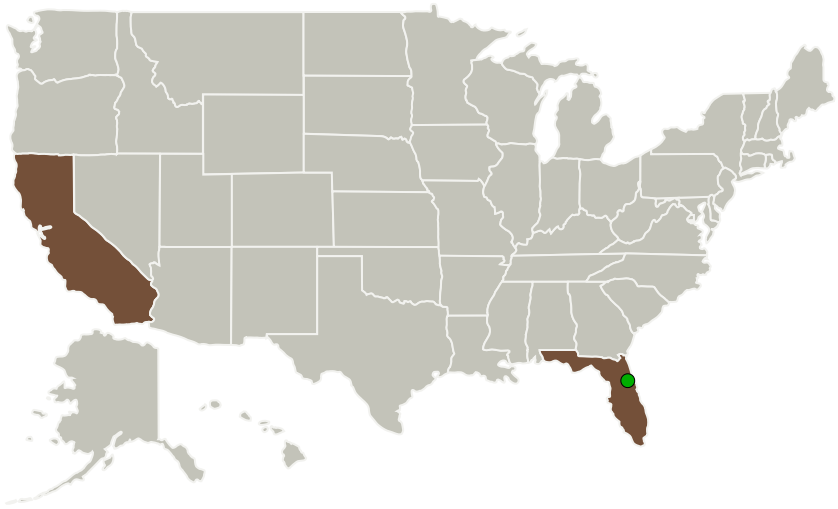
Alternative Hydrocarbon Propulsion for Nano / Micro Launch Vehicle, Phase I

Completed Technology Project (2012 - 2012)

Project Introduction

The technical innovation proposed here is the application of an alternative hydrocarbon fuel – densified propylene, in combination with liquid oxygen (LOX) – that has the potential to enhance the performance of a proposed Nano / Micro Launch Vehicle (NMLV) enough such that a simple two-stage, pressure-fed configuration will be sufficient for orbital missions. Besides eliminating the third stage, the absence of turbopumps reduces hardware costs, improves overall system reliability and simplifies engine start-up. This project addresses Section 1.2.5 of the Technology Area 1 Roadmap as it raises the TRL of both a non-toxic alternative hydrocarbon fuel (propylene) and also propellant densification (subcooling propylene) to increase vehicle mass fraction performance. Programmatic innovation makes it possible to bring this propulsion technology to a TRL of 6 by the end of Phase II in the form of a 5K lbf-LOX/propylene first stage engine. This will be accomplished by leveraging an ongoing NMLV development program that has already produced a flight-proven LOX/ethanol 4.5K lbf-thrust engine that features a long-duration silica-phenolic ablative chamber.

Primary U.S. Work Locations and Key Partners



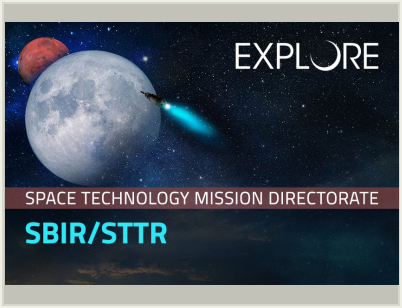


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Table of Contents

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Organizations Performing Work	Role	Type	Location
Garvey Spacecraft Corporation	Lead Organization	Industry	Long Beach, California
Kennedy Space Center(KSC)	Supporting Organization	NASA Center	Kennedy Space Center, Florida

Primary U.S. Work Locations	
California	Florida

Project Transitions

February 2012: Project Start

August 2012: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140264)*

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Garvey Spacecraft Corporation

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Christopher M Bostwick

Co-Investigator:

Christopher Bostwick

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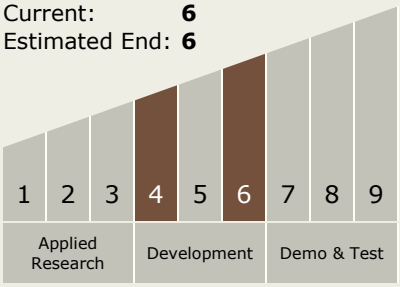
Technology Maturity (TRL)

Start: **4**
Current: **6**
Estimated End: **6**



Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.1 Chemical Space Propulsion
    - TX01.1.2 Earth Storable

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System